

# A VIATION

*The Oldest American Aeronautical Magazine*



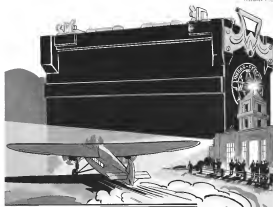
DECEMBER, 1932

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# AVIATION

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The Oldest American Aeronautical Magazine

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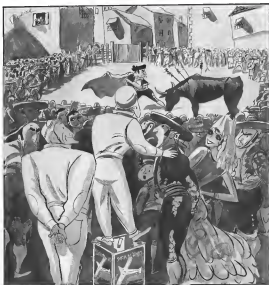
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NEW FOUR GETS ITS FIRST VIEW OF THE NEW  
PITCAIRN FOUR-PLACE CABIN AUTOGIRO

**CAMP WIS, NEW JERSEY.** During a display of modern business' equipment, under the direction of Colonel Leonidas C. Taylor, First Warrenton of the State, officials of twenty-five states recently witnessed a demonstration of the effectiveness of the Autogiro in forest preserve work. Two Sikorski and two Pitcairn Autogiros were used.

**ADDISON, MISS.** A new unofficial world's all-time record for Autogiros, 31,700 feet, was established by Captain Lewis A. Yancy on September 24th at the East Boston Airport. Captain Yancy is executive manager for the Champion Sport Plug Company, and made this record in a standard 300 h. p. Pitcairn Autogiro owned by that company.

**PACIFIC AER, WASHINGTON.** R. E. Bailey, who uses a Pitcairn Autogiro for pursuit of his own extensive sporting birds, was recently awarded a contract which will greatly increase his flying activity. During the current season he will pursue the forests of the Olympic, Rainier, Mt. Baker and Inconspicuous Mountains.

**WINCHESTER, RAPIDS, WIS.** Pilot David McManis, of the Miller Flying Service, in the course of a tour of one-day stops at 27 towns in Wisconsin, Minnesota, North Dakota, Iowa and Illinois, carried more than eight hundred paying passengers in a Pitcairn Autogiro, during a period of thirty days.

**GOLDEN, NEVADA.** Al D. Meyers, veteran prospector of Osidell, Nevada, who formerly covered the rugged recovery of the Western states "from the business desk of a scale," has substituted a Klett Autogiro, and immensely broadened the scope of his work in prospecting and surveying mining properties.

Since the first successful production of the Autogiro in America there has been a demand for greater passenger capacity and comfort. ~ ~ ~ The four-place cabin autogiro developed by Pitcairn Aircraft, Inc., therefore, represents another milestone in Autogiro progress. ~ ~ ~ There are now over sixty Autogiros in the hands of owners serving a wide variety of practical everyday purposes. ~ ~ ~ Upon receipt of request on business stationery a complete authoritative presentation of the Autogiro, in book form, will be sent without cost.

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# AVIATION

FOR DECEMBER, 1932

## Progress of aviation law

THE FIRST OF TWO ARTICLES

By

George W. Lupton, Jr.

**I**N the thirteenth century an obscure constabulary on the River Cole delivered himself of the motto phrase: "Cape ad astra, eyes are wings of vision." Privately translated this meant, "He who sees the sky sees everything above and below from Heaven to Hell." In other words if you purchase a square cent of ground you thereby become lord and master of a limitless rectangular prism of the vortex of which is exactly in the golden center of the earth and the base of which runs upon the Milky Way or beyond, and includes within its limits such men, women, planets and stars as might fall within its imaginary boundaries.

The phrase attained the dignity of a rule of law as the thirteenth century when Lord Coke repeated it. Even at this early date it had been applied in a practical way in a dispute over the ownership of ten young goshawks and in another case involving overhanging eaves. Finally the famous Sir William Blackstone lent the magic of his name to the now finally entrenched rule, and

the words never seriously questioned its universal applicability until the advent of the aeroplanes. Consider at a time when flight by man had hardly been dreamed of, it has lived and flourished until now. It undoubtedly the common justice coincided with the necessity of making new laws for the air.

In 1813 Lord Ellenborough questioned the rights of a balloon to pass over privately owned land and from that time until the present day acute and verbose jurists have argued the semantics of the rule. If this doesn't excite it, consider how the relation is a trespasser.

### Ownership from Heaven to Hell?

A few content modern authorities have seriously contended that the rule should be strictly applied. If their conclusions are accepted by the courts each individual landowner, if he be so fitfully inclined, can sue the owner of every airplane that passes over his land. In 1870 the legal adviser to the Chief of Air Service, U.S.A., caused a trespass in a treaty by expounding its contents to the effect that every flight

involved a series of trespasses amounting to a taking of property without due process of law. According to this respected authority the aviator and his passengers flying beyond the confines of the airport and passing over private property are law breakers, to be dealt with by the trespasser who walks over his newly acquired lawn. The fact that the danger does in each instance is but nominal does not alter the rights of the landowner. A constitutional amendment to remedy the defect in the law has been suggested.

In a case decided in 1822 by our all-powerful Supreme Court, the United States was, in effect, ordered to pay for the right to fly its big guns over property belonging to private owners on an island lying east of Portsmouth Harbor. The opinion, written by Mr. Justice Holmes, did not discuss in so many words the rights of a landowner to the super-jacent airspace but did take into consideration the fact that harm might be done by shells passing overhead and the effects of the concussion. Such a practice was held to trespass



## Airplane plants from the air



Above: The new Sikorsky plant at Garden Wright at Buffalo, which takes out military orders for the manufacture of 400 commercial types more than the Baltimore (top) factory. Both are equipped with cranes from the Wright Commercial subsidiary at Patuxent, D. C. Left: An ideal layout for land and water operations. The Glenn Martin factory near Baltimore not only has a large and convenient dock but also has access to an area of Chesapeake Bay. Note the runway and taxiway.



Above: United Aircraft's expanded operations at Buffalo. In the left background is the main plant where Pratt and Whitney engines are designed, tested, and prepared. To the right lies the home of the well-known Thomas Wright brothers. In the background is the Buffalo Plant and the airport and hangars of United Aircraft of Connecticut. Engines are being heavily loaded by the factory in one conducted by this subsidiary.

Above: Boeing's big line of fighting and attack aircraft. The factory where these planes are the home of Boeing Aircraft of Seattle. This company has been manufacturing airplanes in this location since 1917. The ship building plant at the Tacoma branch is the world's largest of the U. S. Army Air Corps in 1932. The Douglas factory at Santa Monica, Cal., was equipped to handle all military and commercial orders, so it is a regular source of cooperation.



"Way back in 1890 it used to be fashionable for us to claim that we had been making the mistake of trying to sell airplanes and equipment only to each other, and taking the great outside public for granted. In some cases that indictment still has much truth in it, even though the parties concerned may not realize it at all and may think they are doing everything possible to reach the untapped private market. Mr. Rockefeller doesn't think they are, and he is a private aviator who had to be converted himself. Now he has some suggestions to offer on how the industry can convert others, and he does it with so light a touch that you can at least be sure of getting a lot of entertainment from his article. Incidentally, you may get some very useful suggestions

## Growing wings on the business man

By J. W. Rockefeller, Jr.

WHAT is the future of the aviation companies? In which direction lies their most promising market? What are the steps necessary to plant both wheels and rudders in that market at the earliest possible date?

Fifteen years after the War, aviation was still considered an infant industry. It is true that passenger traffic upon established transport lines has increased steadily. Upon the transient business and government contacts the aviation industry of today is almost entirely dependent. How far will the industry expand if it continues to rely solely upon these two outlets for the products of its manufacture? It will be a long time yet before the most ardent advocates of aviation will bring the last army airplane out of the skies and who can deny that the trend is in the general direction of aviation appropriation for national defense?

Travel over established airlines will become increasingly popular. In the meantime of passenger traffic by air may equal the number carried by rail and it is not through this channel that the widest possible expansion lies. The hope of the aircraft manufacturer lies in selling outside the industry—adding private planes to millions of individuals who at this writing have no desire to travel by air, and who in all probability would not accept the least airplane made as a gift if the corporation owned it in an airplane in use it is a regular means of cooperation.

The isolated attempts which have been made to reach the new private owner,



honestly of the man in the motor car off for his Sunday morning ride "the place" at "downtown," and it is unanimously agreed that in none of the best that a private car may find to open at the critical moment the airport advertised will be the logical place to stop for a bit of rest. Two advertising salesmen are brokers for these airplanes.

### Negative advertisement

Last summer the owner of a night club which is located on a small lake asked the writer's opinion regarding the possibility of transporting a general assembly attraction from New York by plane and landing on the lake. The transportation was considered for a Sunday night, a time at which the surface of the lake is usually pretty well crowded with motor and other small craft. The manager of the local airport and the writer concerned in the opinion that the venture would be decidedly disastrous, that some airplane accident might start the shore's undisciplined publicity and become the newspaper headline by virtue of a headline death. This desired neither the night club owner nor the writer, who was located safely and who worked successfully through his progress. The plan, if the writer's memory serves him well, was subjected to a thorough airing; at any rate another attempt was made in the history of things.

Everyone connected either directly or indirectly with the aviation industry can cite from his personal experience a score of similar errors. The airplane has been habitually stored away by pub-

the man who is actually outside the industry, have almost without exception been woefully ineffective. We may summarize the few steps in general advertising and selling as follows: (1) attracting attention, (2) arousing interest, (3) connecting the prospect, (4) obtaining favorable action.

Few companies aimed at the private owner have been carried past the second step. To say that step one and two have been taken with doubtful effectiveness would be a generous understatement. One airport near New York is advertised along the highways as "the most thrilling place in the world." The













T.A.C. repair base at Pontiac, Mich.

## Transport servicing for private flyers

Notes on Thompson Aeronautical Corporation's facilities for servicing Transcontinental Airlines' ships and those of private owners and other operators in the Great Lakes region. The eighth of a series of articles on transport maintenance.

By  
**S. Paul Johnston**  
*Aircraft Editor of Aviation*

IN THE CASE of all the airlines so far studied in the present series of articles on maintenance, it has been apparent that the shops and servicing facilities have developed as a necessary adjunct to the flying schedule. Operations come first, maintenance second, and with the exception of the engine shops, such as those of United Air Lines at Chicago and Chicago which are mentioned in Part I, the engine shops, like the engine maintenance shops, limit their activities to their own requirements, and do not extend work to customers outside their own organization. The relationship between Thompson Aeronautical Corporation and Transcontinental Airlines, however, is radically different. For the latter, air surplus and engine servicing concerns, is the parent and holding company for the operating subsidiary—the outside name inevitably attached to the airline. Thompson Aeronautical Corporation exists not only to keep Transcontinental equipment in flying condition, but, in an event of no greater degree, to make transport grade servicing available for the private and industrial airplane owner in the Great Lakes territory.

The company owns and operates two major airplane and engine overhaul bases, one at Piquette, Mich., and the other at Cleveland. Servicing hangars are also maintained at Detroit, Chicago,

South Bend, Kalamazoo and Bay City. All overhaul work for Transcontinental Airlines is carried out at Cleveland or Pontiac (eventually, but all stations are fitted up to give routine servicing, and to distribute certain standard overhaul parts). The scope of the work at each station is well indicated by the sales room where stock is reproduced here-with. This sheet is of primary interest to the private or industrial owner, but it indicates also the ability of the various T.A.C. stations to serve the airline's ships as required.

The Pontiac base holds Department of Commerce Approved Station Certificate No. 131 and is said to be the only station in the country covering all orders of engines used on transport planes—Wright Pratt & Whitney, Kinner and Lycoming. A machine bank and steel building with attached buildings offers adequate storage space for the airplanes, and houses the office and shops. The inside on one side is a two-story affair. The first floor from front to back houses the operating offices, stockroom, engine shop and motor-test house. The second floor houses office, radio and instrument shop, and wing lift or fabric shop.

Welding and sheet metal working operations are confined to a freestanding one-story wing behind the main hangar. Propeller overhaul and battery charging are taken care of in the hangar proper.

The Cleveland base holds Department of Commerce Approved Station Certificate No. 132 and is equipped to handle virtually the same work as at Pontiac, with the exception of Lycoming engines and Pioneer instruments. Equipment is on hand to take care of all maintenance operations, both on planes and engines. The nature of the engine overhaul facilities is indicated by the fact that cylinder headstocking equipment includes not only Holsi grinders, but also a Holsi cylinder boring machine. Cylinder grinding equipment is found in many airplane overhaul shops, but having long been usually confined to manufacturing plants. Complete testing equipment is on hand for carburetors, magnets, starters, generators and spark plugs. The Cleveland station is one of the few shops in the country now authorized to make major repairs and adjustments on aircraft.

The executive personnel of Thompson Aeronautical Corporation and its subsidiary, Transcontinental Airlines, is identified. Both are under the presidency of R. C. Marshall. John L. Ender is chief superintendent at Detroit, functions as vice-president in charge of

operations. The Pontiac base is in charge of Benjamin F. Hawking, and J. W. Norton heads up the affairs (as at Cleveland). The ground or technical managers are assigned to the several maintenance fields, where servicing stations are located.

Turning now to the operating subsidiary—Transcontinental Airlines Corporation—is equipped in the transport of passengers, mail and air express in an area roughly triangular in shape extending from Chicago to Cleveland, and to Bay City, Mich., in the north. Recently, additional schedules have been inaugurated, connecting Detroit with Buffalo. During the summer months (April 1 to Oct. 1) direct ferry service on amphibians is offered between Detroit and Cleveland across Lake Erie. All other schedules are conducted with land-type machines. Besides the four Cyclone-powered Landing amphibians and on the Cleveland-Detroit run, the equipment inventory at the present time consists of four Lycoming-powered Stinson SM-600s, three Stinson SM-11s, a Waco Stinson SM-6B, a Wright-powered Fokker A-17, two Wright-powered Fokker F-6As, two Whirlwind-powered Pioneer Amphibians, one Whirlwind-powered Traveler, and one Waco. An announcement has recently been made that in the early part of 1938, the fleet will be augmented by four of the new Cyclone-Catara Coach transports. These machines have actually been ordered, and options have been taken on two more of this type.

Flying schedules are so arranged that all passengers, except those passing through Cleveland or Pontiac, have at least one carry-over. Waco-powered Pioneer Amphibians and Fokker F-37s are used between Cleveland and Detroit, and take care of all at Cleveland. The work assigned at this point to keep the three daily schedules in Detroit is the one most numerous so that the greater part of the capacity of the Cleveland base is available to outside customers. A greater number and greater variety of equipment pieces daily through Pontiac so that the proportioned capacity of the company is known in these shops is somewhat greater than at Cleveland,

but the present capacity of the system is such that demand from outside customers may be met with promptness and dispatch.

In accordance with good airline practice, definite schedules have been set up for the overhaul of all flying equipment. Flying time is posted daily from the log books, and engines are changed, or airplanes withdrawn from service when the established time limits have been reached. The Ford Fokker, and Landing equipment in use in the shop for overhaul every 1400 flying hours, the Stinson single-engine outboarders go through overhaul at 1,400 hours, and Pioneer Amphibians and Stinson tri-motors are scheduled for overhaul at 2,000 hours. Wright Whirlwind J-5s and Wright Cyclones are pulled for overhaul at 200-hour intervals. The Wright Whirlwind J-6s, the Pratt & Whitney Wagns, and the Lycomings come out every 350 hours.

Careful records have been kept of overhaul time on all types of engines in use on the line, and the average labor-hours required for complete overhaul, including overhauls, engine starts, generators and radio, are given in the following table:

	Man-hours
Wright Whirlwind J-5	110
Wright Whirlwind J-6	140
Lycoming	120
Pratt & Whitney Wagn	130
Wright Cyclone	170

These figures are averages, and are therefore only approximations for any particular case. Some variations occur,

which are largely a function of the kind of the engine, and the number of parts which need to be replaced at any given overhaul.

Propeller overhaul time does not correspond exactly with engine overhaul time. The three-bladed propellers for the Cyclones and the Wagns are removed for overhaul at 250-hour intervals. Two-bladed Whirlwind and two-bladed Wright Whirlwind J-6 propellers are removed every 300 hours, and the two-bladed propellers for the Lycomings and the Wright J-5s at 250 hours.

All propeller blades are checked at every overhaul. Equipment for balancing and truing propellers is available, mounted both at Cleveland and Pontiac. The engine is done by the Ford Motor Company at Dearborn, although components are now shipped there. The general procedure in propeller overhaul consists of disassembly, checking the bolt for defects with a microscope, making the blade in the usual routine and subsequent thorough inspection for cracks, stress, etc. Minor damage is corrected on site with the correct tools, but if microscopic examination indicates that cracks or dots are deep, blades are immediately discarded. The final inspection is a thorough going, after which parts are reassembled, and the plug checked at a number of stations along each blade.

A number of interesting and useful gadgets have been developed, and are in use in the Thompson shops. Portable work benches, completely equipped with tools for various

### SALES SERVICE CHART

Thompson Aeronautical Corp.  
INC.

AIRCRAFT TYPE	DETROIT OFFICE											
	DETROIT	CHICAGO	CHICAGO	CHICAGO	CHICAGO	CHICAGO	CHICAGO	CHICAGO	CHICAGO	CHICAGO	CHICAGO	CHICAGO
Wright Whirlwind J-5	X	X	X	X	X	X	X	X	X	X	X	X
Wright Whirlwind J-6	X	X	X	X	X	X	X	X	X	X	X	X
Lycoming	X	X	X	X	X	X	X	X	X	X	X	X
Pratt & Whitney Wagn	X	X	X	X	X	X	X	X	X	X	X	X
Wright Cyclone	X	X	X	X	X	X	X	X	X	X	X	X
Wright Whirlwind J-5	X	X	X	X	X	X	X	X	X	X	X	X
Wright Whirlwind J-6	X	X	X	X	X	X	X	X	X	X	X	X
Lycoming	X	X	X	X	X	X	X	X	X	X	X	X
Pratt & Whitney Wagn	X	X	X	X	X	X	X	X	X	X	X	X
Wright Cyclone	X	X	X	X	X	X	X	X	X	X	X	X
Wright Whirlwind J-5	X	X	X	X	X	X	X	X	X	X	X	X
Wright Whirlwind J-6	X	X	X	X	X	X	X	X	X	X	X	X
Lycoming	X	X	X	X	X	X	X	X	X	X	X	X
Pratt & Whitney Wagn	X	X	X	X	X	X	X	X	X	X	X	X
Wright Cyclone	X	X	X	X	X	X	X	X	X	X	X	X

Showing that Whirlwind J-5s and J-6s are available to outside customers.

DET service chart showing work which can be done at each station.

engine cylinder heads and pistons for cleaning, grinding, fitting and reaming, and valve gear, light and steady servicing, pistons and connecting rods, and in an emergency adjustable engine stands represent the many items of the sort in use. Among these devices is one that points toward an idea which will revolutionize the subject of control study in the part of designers in the next few years—the demonstrable power plant. At Pontiac, standards have been laid to take complete wing or motor engine assembly for the Lycoming-powered Stinson tri-motors. The engine and the other are completely assembled.

on the stand, and the final provision on the ship carrier matrix of removing a complete assembly (except for coming) into place, the source and lighting at a relatively few supporting bolts and the connecting up of the cords. The idea is not wholly new, for aircraft assembly jigs have also been put in use at the American Army ship in Dallas for Fokker F-40s, and in the Pan American shops at Brownsville for Fords. There are still many difficulties to be overcome before a practical solution is available, but it is not too much to expect that in the near future complete airplane power plants can be made interchangeable in the shipyard, that various materials required are today in some less maintenance stations require changes require incredibly short time, a matter of minutes, and disengagement of the sort mentioned above goes toward the possibility of quicker maintenance in the aircraft field.

Transmeridian Airlines storage battery practice differs slightly from that of most of the other lines. Generally speaking, batteries in transport airplanes are removed and put on charges on the voyage at once a day, regardless of the actual condition of the battery. "That on ships which fly a schedule long enough to consume the better part of a day, the battery is put in fresh at the point of departure, and removed at the terminus—a fresh battery being substituted before the airplane returns to its base. All transport airlines are usually equipped for battery charging, and the batteries are in constant circulation. On the voyage, a battery may be one day in the air and one or two days on the ground undergoing charging or reconditioning. The United and Western airlines batteries on Transmeridian are handled on a schedule which varies somewhat, depending on whether or not the ships in

which the batteries are placed are equipped with generators. Those airplanes (Panamas and Anglo-American Steamers) which have no generators, have their batteries recharged and charged every day. Batteries in service on ships with generator equipment (Lochs, Fokkers, Stearns and others and Fords) are expected daily, but are

not removed for a bench charge unless the tests indicate the battery is in need of attention. The relative merits of the two methods of handling batteries can be determined only as a rule, but with this type of service in which the batteries are subjected, Transmeridian reports that the average battery life is about six months.

## Dope room fires

THE fire hazard involved in handling dope in airplane repair shops has long been recognized, but in spite of elaborate precautions, fire occasionally breaks out without warning in one of the most modern shops. A case in point was reported to the Navy Department from Letter No. 287 dated Sept. 1, 1932, describing a fire which occurred in the dope room of the Naval Air Station at Norfolk, Va., on June 24 of this year.

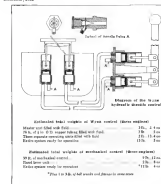
The shop is of modern concrete and steel construction, and is ventilated through two ducts taking air through false ceilings in kitchen inside the building. The air speed in the ducts is about 14 mph, and the blowers have enough capacity to give a complete change of air in the dope room in a little over one minute. With such complete ventilation it is difficult to see how sufficient more could accumulate to support combustion. For some reason, however, fire broke out under the floor grating from which it spread rapidly to two airplane wings standing in racks nearby. Prompt action on the part of the shop personnel and the automatic

sprinkler system brought the flames under control, and limited the actual damage to the two wings.

A board of investigators made certain recommendations which should be of interest to anyone concerned with the cleanup of airplane workshops. These were three probable causes suggested—first, ignorance from a lack of knowledge (in spite of a rigid rule against smoking in the shop), second, a piece of sand paper may have struck the hanging for blades, causing a spark that ignited the gases in the ducts, and third, a spark may have been caused by a shoe nail or a tool dropped on the concrete floor or on the grating. It was recommended specifically that all gratings be replaced with non-metallic material, and equipped with screens to keep foreign matter from dropping into the ducts; that no smoking be allowed in the shop.

Since freshly dropped articles are proof positive, a great deal of stress may be placed on the importance of the fire prevention measures that all supporting members for dope racks be thoroughly grounded. Motors driving fans should be kept outside of the dope rooms and should be of the squirrel cage type. Motor frames and all parts requiring contact should also be electrically grounded.

Day lighting is a source of static electricity, and should never be strapped when dope boxes are present. In addition, the obvious precaution should not be forgotten. The maximum possible amount of dope should be kept in the shop at any one time, and the rule should be that no dope should be kept in the shop unless it is to be used immediately. Dope should be kept in airtight containers and should be kept in airtight containers.



## Hydraulic throttle control

THE ordinary throttle control on an engine usually involves a combination of push-rods, bell-cranks, and springs. For a three-engine installation, it is quite a problem to design an efficient control mechanism for the three engines, but, if it is to be used on a four-engine engine, it is obvious that an engine displacement of the throttle lever will produce a corresponding angular displacement of the throttle valve. Each cylinder is fitted with a variable valve of

Copper tubing connects each cylinder to the Wynn system. When each cylinder and tube is completely filled with a non-compressible non-freezing fluid (No. 3 Lockheed Hydraulic Water fluid, for example), it is obvious that an angular displacement of the throttle lever will produce a corresponding angular displacement of the throttle valve. Each cylinder is fitted with a variable valve of

Referring to further improvement is possible, J. H. Wynn and Harry Johnson have designed and built one of a mechanically new type of throttle adjustment which affords interesting possibilities for the control of outboard engines. The outline drawing shows the operating principles of the Wynn system. The throttle lever in the cockpit is connected by suitable linkage to a pair of plungers operating in two small parallel cylinders. An actuated the lever arm are so arranged that as one plunger moves forward its cylinder the other moves backward. The latter valve is at the extremity is fitted through a tube to a corresponding pair of cylinders

the middle type (A) to permit filling of each leg of the system completely without the aid of an auxiliary supply tank and pump are used to fill the system on the ground, but are not necessarily carried on board the ship. Rather, the pumps are present in the airplane cylinders.

The two hydraulic elements of the system are completely balanced at all times, and are under no pressure to cause leakage. If necessary, the system will still continue to function with one of the hydraulic components completely broken. Sufficient strength can be obtained in the operating cylinders, so that a movement of the lever in either direction can be obtained under an emergency condition of the sort.

Calculations indicate that the Wynn system may be installed on an average three-engine airplane at a total weight of about the same as the mechanical system which it replaces. For a typical installation the comparative weights of the Wynn and the present mechanical installation are set forth in the following table.

The weights given above represent the system in its present stage of development. It is felt that further simplification can be accomplished by certain refinements of design. For example, the weight reduction is based on a specially constructed operating valve, whereas the ordinary valve will probably involve more than twice the weight of the present, resulting in some further saving.

Furthermore, the functioning of the Wynn system is independent of the shape of the outboard engines, but, as they have been made to fit around various in place of the large radial block or the complicated system of different and movements required in other systems.

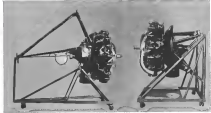
The Wynn hydraulic control has been flown for some hours in a single-engine airplane, and arrangements are now being made to apply it to a tri-engine installation for thorough test.

## Welding hangar floor

THE Electric Journal for October, 1932, reports an interesting welding job in the new Navy hangar being constructed at San Diego, Cal., to accommodate the airplanes of the Albatross-class. Because it is sometimes necessary to dig the single blocks contained over the floor, it is perfectly smooth surface without protruding bolt or rivet heads was required. Steel plates 1/4 in. thick were laid over a

side foundation, and were welded together in place along their adjoining edges.

After the welding, the plates were ground down and seams polished until the entire area was so smooth that it was difficult to detect the joints. The total area of the floor was about 100,000 sq. ft. at this point, the job requiring about 40,000 lb. of electric arc welding.



Left: Welder working on the welding machine in the hangar. Right: Close-up of the weld joint.

## EDITORIALS

AVIATION

EDWARD F. WATNER, Editor

Selling air transport  
is everybody's job

THE readers of *Aviation*, without exception, have a deep personal interest in the prosperity of the aeronautical industry, from which a very large proportion of these actually drew their livelihood. Fortunately, their interest need not be a questant one. You need not wait for prosperity to be handed to you or a silver platter. You can go out and create it for yourself.

An airplane is the new backbone of the industry. It is air transport that is stiffening the whole structure. If we want to promote the success of aircraft factories, or of any kind of aerial operation, the most important thing that we can do is to work for an increasingly rapid public acceptance of travel by air, and in that every one of us can take a hand.

We may not all have the opportunity of giving sales talks on air travel. Some of us may be so lacking in the gift of salesmanship that it would be of little service to that connection in any case, but whether or not we can take a positive part in the development of traffic, we can at least refrain from taking a negative one.

Air transport has cleared its first hurdle. Its existence is generally recognized. Almost everybody now knows that it is possible to travel from one city to another more quickly by air than in any other way, and at a cost not much exceeding that of the railroad journey. What remains to keep people out of the new air is not so much ignorance of the service that is being rendered as fear, suspicion, uncertainty, and inertia. Those factors will pass of their own accord if they are given nothing to feed upon. It is the proper job of the people actively interested in aviation, and that goes not only for those in the employ-

of the transport companies, but for draftsmen, airport managers, public pilots, and a whole lot of others,—to see that suspicion and its ugly kinsmen are deprived of nourishment.

OBVIOUSLY, nothing will create suspicion so effectively as a feeling that aeronautical operations are beyond comprehension by ordinary young contemporaries. There was a time when there was some reason for such a feeling in connection with early air transport operations, but it has long since passed. If you want to know how completely it has passed, turn to *AVIATION* of three years ago, and read an article by J. W. Ward, entitled "Air Transport From the Passenger's Point of View." It was a tale of heretofore adventures sounding from a mechanized world. At the time when it was published it was a fair and conservative story of what actually commonly went by the name of air transport. Only three years have passed, and already it reads like a tale from another world, so utterly remote is it from present-day experience.

So far the work has been well done, but the potential customer of air transport does not always discriminate. They do not realize the difference between transport personnel on duty and transport personnel enjoying their leisure. They do not even distinguish between air transport companies and a thousand miscellaneous operators. The public judges the aviation business and the people in it as a whole, and the public's point of view toward air transport over the next two or three years is going to depend very largely upon what kind of people seem to be in the aviation business, and how they seem to behave.

THREE years of this editorial sort owed a routine cycle. He brought it from a local dealer who was a jovial person with a host of friends, generally accustomed to be "in great gay and a well-served."

About a week after the machine had been sold, and while it was still being garaged in the dealer's shop the great guy around himself one evening by interchanging the ignition wires on the magneto so that each cylinder fired at the end of the exhaust instead of the compression stroke. Then he stood around making pleasantly idiotic suggestions while the proud but somewhat nervous new owner struggled in vain to get the machine started. It was a good joke, and the victim was able to laugh along with the suggestions, though somewhat fun-bourteously, when it was explained to him. It was a good joke, and that particular dealer since went out of business. There were a lot of people just like him in the motorcycle business, which is one reason why it has gone so miserably on the rocks. This case is worth bearing in mind as a horrible example. A few wild pilots, or a small number of aeronautical people with eccentric habits and unbridled access of humor, can do more harm to air transport than the most skilled salesmen can counteract in a year. If a sober person gets it into his head that airplane pilots are likely to be silly practical jokers or irresponsible victims of adult idolatry, it is going to be a difficult matter to convert him to air transportation.

THINK of us some 10,000 airplane pilots in the United States, and they are all kinds. Most of them are self-respecting gentlemen with a sense of having entered upon a dignified profession, some of them are not. Every one of them has the prosperity of air transport in his keeping in some measure. Every one of them ought to bear that in mind, and to be reminded of it as often as necessary. If the pilots who are out of work now want to get jobs, or if those who already have jobs want to get better ones, it is very much in their interest to help air transport grow. They can do it by maintaining a personal appearance and a standard of behavior, both in the air and on the ground, which will command the respect of those with whom they come in contact, for it is the opinion of industry who ought to be traveling by air that supports the aeronautical people that he uses, he cannot help feeling respect for the aviation business staff.

Flying boats  
to French Frigate

ALMOST unknown and unused, a Navy patrol squadron attached to the Pearl Harbor Air Station has recently staged a flight that may open a new era in American high-seas aviation. Six flying boats have cruised in formation from Pearl Harbor, a few miles west of Honolulu, to French Frigate

Shoals. They landed at French Frigate, stayed over night, and took off again the next day and came back home. The distance was only 800 miles. The speed was only 35 mph. Compared with the exploits at French Hevels, Doublet, or Fast and Gusty it sounds an unimpressive performance, but it was the symbol of a new idea.

Take the largest ship that you can find, open it to the map of the Pacific, and look for French Frigate Shoals. It may not be there. Little more than a coral reef awash in a boundless ocean, it is beneath the notice of many of the map-makers. The charts show it only as a spot upon which a ship might run aground. Yet it has become an aeronautical landmark.

American pilots and naval aviators have largely in the Pacific. Flying boats will never have attained their supremacy in the Naval service until they are able to operate freely over the Pacific. Up to the present time all of our flying-boat operations have been essentially coastal in nature. The patrol squadrons have worked out of Key West and Guantanamo and Coco Solo to cover the Caribbean. They have operated along the Pacific Coast of the United States and Central America and within the near group of the Hawaiian Islands but they have never yet really struck out across the sea under service conditions. The NC boats made a beginning in 1919 with a transatlantic flight, but it was never followed up. There was another trial in 1923, when the PSP's set out from San Francisco for Hawaii, but that was a stunt and not a wholly successful one. In the meantime, the flying boat squadrons of the WAF, have been probing the comparatively sheltered seas of the Eastern Hemisphere, and even reaching out into the Pacific as far as Australia and the Philippines. Von Gronow has repeatedly crossed the North Atlantic, and finally completed a laudatory jaunt by flying boat around the world. Most spectacular of all, the Italian Air Force, after years of preparatory cruises on a more moderate scale, have flown a squadron of boats from Chile to Brazil by way of West Africa. The time has long been ripe for the American Navy to undertake serious flying-boat cruises of its own, by squadrons or even larger groups.

THE flight to French Frigate, small as itself, is a beginning. Beyond French Frigate lies Midway, then Wake, and then Guam, and then the Philippines, and if there under the American flag and with no help of over 1,600 miles to separate them. To the south of the Philippines is Australia, and then to the east, at distances of 1,500 miles or less, come the new Hevels, the Fiji group, and, getting back to no American soil, Samoa, Palmyra, and once again Hawaii. The Southwestern Pacific could be circumnavigated in 15,000 miles. The patrol squadrons would have gained a new experience, given their equipment a new test, demonstrated an ability which we fully believe that they possess to operate over distances hitherto









## FLYING EQUIPMENT



The four-engineer British Heinkel

### A departure from the conventional

BY FAR the majority of the aircraft discussed in these columns during the last twelve months have had at least one characteristic in common—they have lacked aerodynamic novelty. Improvements have been very much in evidence, but they were essentially modifications in accepted design standards, and radical variations have been seldomly avoided. A new step has been irretrievably taken down, however, which, although increasing many conventional features, shows definite originality. Walther Borch, with his own pilot and designer, interim president of Curtiss-Wright, has produced in Whitehall, London, the first of a new series of British aircraft embodying unusual characteristics.

Regulus, which has occasionally appeared on certain military machines to improve the visibility ahead and above from a forward cockpit, has the 36 cent negative setting of the top wing of the Borchcraft in a similar departure to American experimental practice. The reason for its adoption is essentially the same—better glide visibility forward, coupled with certain structural advantages, chiefly the location of the front spar of the top wing with relation to the fuselage and landing gear. The angle of an "edge" wing is attached to the upper front spar at the outer struts or tips, and then through the lower wing in the landing gear, thus forming a very deep and rapid transition system.

Aerodynamically, negative stagger has been viewed with some suspicion in the past on account of a tendency of the lower wing to "blow" the top wing at high angles of attack, sometimes result-

ing in uncontrollable stalling and spinning tendencies. Wind tunnel tests on the new model, with its unusually high degree of negative stagger, have indicated, however, that the lift curve of the Borchcraft is relatively flat topped, and has no marked tendency to fall off sharply at angles of attack as high as 30 deg. It is claimed that the combination of aerial and the aerodynamically selected results in an improvement on air flow over the top wing at angles near the stall.

The apparatus "donates" the design indicated not only high top speed for a given power expenditure, but also permits to high landing speeds and consequent difficulties in getting down into limited areas. Numerous experiments on dips, spins, "wet landings," and the like have been tried to test the tendency of such steps to pick up speed in a glide. The test

must device is employed in the British designed Pan-Mach, and is the Borchcraft. On the latter, the glider is built up as a whole by means of two landing gear struts broadcast to the wing (AVIATION, page 19-1, page 305). The same effect is obtained on the Borchcraft by the use of a split rudder. For ascending, the two struts of the rudder are folded together, and function in the normal manner. To

fall maximum gliding speed, however, the two halves may be swung apart, and thus act as stabilizing vanes. During the early stages of the landing roll, the aerodynamic effect of the "downfolding" is of assistance to the mechanical brakes in bringing the machine to a stop.

The landing gear is completely enclosed in housings which are folded inwardly into the lower wing and into the fuselage through a pair of short struts. The slip wheel is non-swiveling, and is almost completely enclosed in the under part of the fuselage. This construction makes for simplification in design and stress weight and maintenance expense. It has little apparent effect on the ground maneuverability of the machine. Advances have been taken of the span afforded by the flaps at the introduction of wing, such and gear in a small large landing field. The wheels are non-swiveling into the housings from the tail up position, however, enough of the wheel protrudes to permit a safe landing. The operation is through electric motors. Similar servomechanisms are used to adjust the stabilizer struts.

The fuselage is completely metal covered, and is mounted to a point behind the cabin. All landings at the wing root, undercarriage and fuselage are integral parts of the structure. The cocoon of the cockpit forward is worthy of note, as it comes out the fuselage from its own own frame.

Advances are mounted on lower wing only. They are of high aspect ratio, and are angled for differential operation—4 deg. up and 13 deg. down—a feature which improves control at the stall. Wing fences are of steel, with



The Borchcraft, and at the White Wing airplane on which Captain Giff Evans set a new altitude record at 17,000 ft.

### AVIATION December, 1942

also spaced 6 in. apart. All surfaces are fabric covered. A single stream line, two-holed steel set of the running type connects upper and lower joints in each bay. The wire and cable fittings are enclosed in the wings.

All flying controls are fitted on ball bearings which are sealed against dust and which require no lubrication or attention. Considerable study has been made of the feasibility of all parts for maintenance. Hence, finally, for example, is put on its hinges sections which may be readily lifted or removed. The main action is fixed to the engine, and only the outer joints need be fitted for servicing.

The engine fitted on the present Model 178 is a Wright Whirlwind R-2220-3, an engine a French modelable push propeller. The ship has not been analyzed for the new Wright two-row 560-hp engine. Engine driven fuel pumps are mounted, although a hand pump is available for emergency operation. Spare accessories are included as standard equipment. Radios are included and this apparently special-purpose fuselage is painted under the fuselage. Color lighting and ventilation are provided, and single baggage space is available.

The general characteristics as furnished by the manufacturer are: Span, 34 ft. 4 in.; length, 34 ft. 2 in.; height, 8 ft. 7 in.; wing area (including ball area across fuselage), 300 sq. ft.; weight empty, 2,500 lb.; useful load, 1,800 lb.; gross weight, 4,300 lb.; wing loading, 15 lb. per sq. ft.; power loading, 107 lb. per hp.

### Pegasus makes the highest jump

THE HIGHEST record of Sept. 16, is clear the world's altitude record by 300 ft. A Flight Lieutenant C. P. Davis and a standard Vickers Vixen biplane (500) with a Bristol Pegasus engine, which had been modified somewhat in design, had stood for weeks at extreme altitude. This engine is a development of the Pegasus, a well-known British aircraft type. It is a two-cylinder radial engine, which is a development of the Pegasus, a well-known British aircraft type. It is a two-cylinder radial engine, which is a development of the Pegasus, a well-known British aircraft type.

The standard Pegasus models S-3 and S-5 are designed for high altitude and are typical with a normal compression ratio of 5.3:1, and a normal sea level output of 250 hp. The model S-3 has a 4.4 gear reduction. On the opposite line output (Augsburg, Gipsy III, or Hawk) has permitted the use of a narrow oval-shaped fuselage which is usually seen in conventional American light plane patterns. The two fuselage outputs are completely covered with a semi-rigid transparent fuselage with panels sliding back and forth to permit easy access. The live of the cockpit railings



For the world-wide British model

are made at a top speed of 2,800 r.p.m., at which speed the total compression ratio is 10.5:1. Although normally the thrust should never be fully spent at gross-level, some have indicated that with full engine charging the engine should develop 4,000 hp at sea level. Calculations indicate that at the altitude reached by Lieutenant Davis, the actual output was about 170 horse-horsepower. It was not too much to increase the compression ratio to 4.1 in the hopes of raising the output against 2,800 r.p.m. with the same surplus and the same engine.

### Heinkel He54 in the 1932 Rundflug

SOFT, flaps and exceptionally light construction to design details have made possible an almost unprecedented speed range for the Heinkel He54 monoplane, which record among the world's fastest aircraft. The Heinkel He54 monoplane, which record among the world's fastest aircraft. The Heinkel He54 monoplane, which record among the world's fastest aircraft. The Heinkel He54 monoplane, which record among the world's fastest aircraft.

The Heinkel He54 monoplane, which record among the world's fastest aircraft. The Heinkel He54 monoplane, which record among the world's fastest aircraft. The Heinkel He54 monoplane, which record among the world's fastest aircraft. The Heinkel He54 monoplane, which record among the world's fastest aircraft.

is carried along the top of the fuselage into the fin. The structure is a semi-monocoque, consisting of a main fuselage and a large vertical fin with fin-like wings. Some are provided as covering at strategic points to permit operation of the interior. The latter involved steel tube engine mount is located at the altitude reached by Lieutenant Davis, the actual output was about 170 horse-horsepower. It was not too much to increase the compression ratio to 4.1 in the hopes of raising the output against 2,800 r.p.m. with the same surplus and the same engine.

The wing is trapezoidal in shape, is built entirely of wood, and is attached to the fuselage through short struts. Following European practice in general, and the requirement of the recent aviation competition in particular, the wings may be folded back against the fuselage for storage purposes. A simple lever-operated latch permits the retraction of the wings forward in about 30 seconds. The fuselage is left overboard, but around a single spar, and are provided with interconnected automatic dual and trailing flaps. This is used to be the first application of dual and flaps on a machine with a single spar wing. The tail sections are of similar construction to the main wing—primarily covering an outer rib and spar.

The split dual fuselage is of conventional design, formed by two struts from the wingtips of the fuselage. One or two struts take care of the landing struts, and the whole are fitted with fuselage operated by a hand lever. With an eye toward the limited maintenance facilities of the average operator, the Heinkel He54 has been carefully studied for accessibility and understandability of parts. All components are easily available for inspection, and so special tools are required for repair work. Spare parts are available in the form of a standard and standard. The engine involves such accessories as fire extinguishers, paraffin, fuel, gear, and standard.

The specifications furnished by the manufacturer are: span, 32.5 ft.; length, 27.5 ft.; height, 2.5 ft.; wing area, 150 sq. ft.; gross weight, 1,500 lb.; useful load, 1,000 lb.; gross weight, 1,500 lb.



## TECHNICAL ABSTRACTS

More data  
on nacelle drag

DETAILED DATA ON A-109 SCOUT MONITOR, EX-2000 MONITOR, AND VARIOUS OTHERS, by Roy Wiegand, Technical Note No. 402, National Advisory Committee for Aeronautics.

IN THIS COURSE of the investigation of the interference effect between nacelles and wings under way at Langley Field, a detailed study was made of nacelle forces apart from the wings, to determine optimum shape and the effect of various types of nacelle positions. To these tests, an attempt was made to isolate propeller effect. All results were obtained without propellers. Two general nacelle forces were tested, the first (B) was the so-called conventional nacelle. The second (J) was the NACA C nacelle. As a general check, a rough body of approximately the shape and size of the small nacelle was included in the series of tests (A). The ranges applied in the two series of roof tests of three general types first, the full NACA C nacelle, second, a series of three three-stage roofs, and third, a variable-angle roof. The four-stage roofs were relatively wide and thin, and the angles between the main chord and the three lines of the nacelle nose 10 deg., 20 deg., and 30 deg., respectively. The variable-angle roof was made up in a form of a semi-circular plate, and the chord angles of each side could be varied from zero degrees to 15 deg. with respect to the thrust line. The free-angle roofs were used in three different series and also with respect to the plane of the nacelle cylinders (F, G, H) and the variable-angle roofs tested in two free and all positions (I, J, K).

It is impossible to give in a brief report the detailed discussion and the full results of these tests, but the accompanying text and illustrations clearly demonstrate a reversal of the axis stated up for full-size nacelles at 140 miles an hour, will give some idea of the general trend, and the relative values of drag.

It is shown that the popular belief that almost any kind of a roof nacelle will reduce the drag of a nacelle on an airplane. Several combinations of nacelle and wing drag which are considerably higher than that of the bare nose. Although the fore-and-aft location of the drag effect from the angle of the wing, and to the thrust line is a much more delicate factor. The full NACA C hood in its optimum position gave better results than any combination of fixed or variable nacelle

ring in any location fore and aft. Even the bare NACA C nacelle without hood gave lower drag values than most of the variable or fixed-angle roof combinations, and the complete NACA C nacelle with hood in position yielded a drag figure below that of the smooth streamlined body tested.

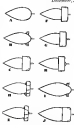
Tests were made on all combinations of nacelle and wing at various angles of pitch. There again the full NACA C nacelle gave the best results. In general these combinations which had the lowest drag at some degrees of pitch, had the lowest drag throughout the entire pitch range, but the lower the drag of the combination at zero degrees pitch, the higher is the percentage of increase of drag on the angle of pitch is increased. These results cannot be considered as conclusive, for the effect of the propeller must be taken into account. It has been found that the nacelle which gives the lowest drag without the propeller is not always the best combination with a propeller mounted. That report says, therefore, be considered as preliminary, as further work will have to be done with complete nacelle and propeller combinations.

On the problem  
of engine cooling

HEAT DISESSIPATION FROM A FOUR-CYLINDER AIR ENGINE TEST CELL, by George W. Jolley and Arnold E. Sherman, Technical Note No. 420, National Advisory Committee for Aeronautics.

AS THE problem of engine temperature and its effect on engine performance has become the development of air-cooled engines, investigations have been conducted at the Langley Laboratory with a view to this problem. The objective of this study was to determine the effect of air-cooled engines and the rate of heat dissipation. A source of a steady-state flow of air was used to simulate the flow of air over the engine. The engine was equipped with variable electrical heating and temperature measuring apparatus, and recorded in a test tunnel in such a manner that the angle between the air stream and the cooling fins could be varied between 45 and 90 deg. Tests were conducted every 10 deg. in the heat source, resulting in 12 to 240 Btu per square inch of inner surface per hour, at a constant air speed of 76 mph. Tests were also conducted over the same angular range at a constant test speed of 170 ft. per square inch per hour, at present air speeds ranging from 20 to 150 mph.

Temperature readings on all parts of the cylinder indicated that the rate of heat dissipation is greatest when the cooling air is directed at an angle of 45 degrees with respect to the cylinder fins. For a given heat input the temperature difference between the cylinder and the air stream is reduced from 30 to 20 per cent with the flow at 45 deg., as compared with air-flow parallel to the fins. The amount of the reduction depends on the air velocity and the point selected in the cylinder. With the same average cylinder temperature, the total heat input to the cylinder can be increased 50 per cent with an air stream angle of 45 deg., as compared with a parallel flow.



Group of Wright D-1 engine nacelles, full scale, at various angles to wing and nacelle thrust line.

A. Smooth streamline body.  $C_D = 0.44$ .

B. Conventional nacelle with bare wings.  $C_D = 0.75$  B.

C. Conventional nacelle with 15 ft. A.C. hood in optimum position.  $C_D = 0.4$  C.

D. Conventional nacelle with variable-angle roof fixed in forward position.  $C_D = 0.4$  D.

E. Variable-angle roof fixed in rear position.  $C_D = 0.4$  E.

F. Variable-angle roof fixed in rear position.  $C_D = 0.4$  F.

G. Variable-angle roof fixed in rear position.  $C_D = 0.4$  G.

H. Variable-angle roof fixed in rear position.  $C_D = 0.4$  H.

I. Variable-angle roof fixed in rear position.  $C_D = 0.4$  I.

J. Variable-angle roof fixed in rear position.  $C_D = 0.4$  J.

K. Variable-angle roof fixed in rear position.  $C_D = 0.4$  K.

L. Variable-angle roof fixed in rear position.  $C_D = 0.4$  L.

M. Variable-angle roof fixed in rear position.  $C_D = 0.4$  M.

N. Variable-angle roof fixed in rear position.  $C_D = 0.4$  N.

O. Variable-angle roof fixed in rear position.  $C_D = 0.4$  O.

P. Variable-angle roof fixed in rear position.  $C_D = 0.4$  P.

Q. Variable-angle roof fixed in rear position.  $C_D = 0.4$  Q.

R. Variable-angle roof fixed in rear position.  $C_D = 0.4$  R.

S. Variable-angle roof fixed in rear position.  $C_D = 0.4$  S.

T. Variable-angle roof fixed in rear position.  $C_D = 0.4$  T.

U. Variable-angle roof fixed in rear position.  $C_D = 0.4$  U.

V. Variable-angle roof fixed in rear position.  $C_D = 0.4$  V.

W. Variable-angle roof fixed in rear position.  $C_D = 0.4$  W.

X. Variable-angle roof fixed in rear position.  $C_D = 0.4$  X.

Y. Variable-angle roof fixed in rear position.  $C_D = 0.4$  Y.

Z. Variable-angle roof fixed in rear position.  $C_D = 0.4$  Z.

## AIRCRAFT AT WORK

Air express and  
the movies

MODERN transportation facilities as shown in the handling of moving picture news rolls by air express. The public appeal of the news roll depends to a great degree upon the speed at which it can be distributed. This is especially true of pictures that carry with them important news items by some of the well-known land agencies of the screen, for they cannot be distributed until the appropriate sound recordings have been made and incorporated in the film.

The original film, when worth many thousands of dollars, must be moved to New York or Chicago or other centers for development, and then back to the chief points for distribution, such as Atlanta, St. Louis or other large cities. A sound accident will disrupt the scenes employed in secure rapid distribution. A series of pictures of the recent Chinese-Japanese conflict, which shipped by steamship from Japan in order to make satisfactory air express connections for the rest, the news roll company chartered a airplane to pick up the film from the steamer some hours out of Seattle. This was done with considerable difficulty at a heavy sea was running at the time, but by using a berthing-life boat, a film was able to the steamer's deck, and the package of film brought ashore. The airplane then returned to Seattle where the package was turned over to the Railway Express Agency. Connections were made by Varney Air Lines for Salt Lake City, where the film was then transferred to the regular scheduled schedule of the Boeing division of United Air Lines. Arriving at Newark Airport, the package was rushed by truck to the Pennsylvania Railroad where a special passenger pulled it up and transferred it to the New York station in southern New York.

Previously news reels arrive at the Newark Airport at night, and each carry a balancing force must be kept on hand at the station at an overnight cost of \$300 an hour, to be ready to go to work on the picture. Under these conditions any delay results in real disaster. The interlocking air express and delivery services, both by day and night, however, has practically eliminated difficulties from this source.

On hand at the station at an overnight cost of \$300 an hour, to be ready to go to work on the picture. Under these conditions any delay results in real disaster. The interlocking air express and delivery services, both by day and night, however, has practically eliminated difficulties from this source.

Air travel expedites  
pipe line contracts

BY AIR express use of the established pipeline, two officials of the Halcott & Wilcox Company of Denver were able to successfully enter-ber their competitors on an \$170,000 pipe line which was built in connection with the Hoover Dam. The necessary negotiations for material and labor which, in the ordinary course of events, might have taken from a year to a year and a half to complete, were successfully closed in five months. During that time the two men traveled over 55,000 miles by air in just practically every corner of the United States.

A flying  
dress salesman

TRAVELERS dropping in on remote villages in Alaska need not be hunting in vain for the latest styles. The dress of the latest Paris styles. Since conditions at home make it impossible for the Indian and Eskimo people to visit clothing establishments of the large cities, Mark Coleman, proprietor of a firm shop at the town of Kotzebue, purchased the idea of a flying dress salesman. For some time he has been a limited territory by mail, but he has found that his range of operation has been greatly increased, and the business has increased by the use of an airplane. Mr. Coleman purchased a Stinson Junior monoplane on Kodiak, and engaged a pilot to fly the

ship. The pilot was fitted up to carry a cargo of dresses, coats and other garments wearing apparel. In a single season this flying salesman has sold Alaska, as the "Flying Dress Sales." By carefully matching his visits with the pay-off periods at the season's end, Mr. Coleman is able to cycle his customers in a spending mood. Only through the use of an airplane could he be able to visit this profit-laden region. [Courtesy of The American Weekly, Oct. 2, 1947.]

Airplanes aid  
Czech food industry

PROFITABLE interchange of certain perishable foods between Czechoslovakia and the metropolitan districts of Berlin, Paris, Amsterdam and London have been materially aided during the past summer by dispatches over Czechoslovakian airlines. The airplane carries vegetables, an important product of the country in Berlin and London at an established rate of 12 and 30 cents per kilogram respectively. On the return trips to Prague, the ships carry potatoes, apples and other foodstuffs which are at a premium in the food-limited territories of Czechoslovakia. In the past, the receipt of fresh produce has been crippled by their perishable nature.

Antigiro  
sky ads

SEVERAL effective advertising campaigns have been launched by one of a number of Eastern cities by the use of large signs shown behind Kollat's station. The signs are still of sufficient novelty to attract attention, and the banner from 150 to 200 ft. high, carrying letters 9 ft. high, making about 400 ft. behind the city makes very effective the advertiser's copy.

STANDARD INTERLUDE

## THE BUYERS' LOG BOOK

## Welder's truck

**A**N improved truck for the handling of oxygen and acetylene bottles is being shipped by the Lima Air Products Company for distribution by Frost-D-Well and Purvis dealers. The new No. 5 truck increases the size and convenience of moving a welding or cutting outfit from place to place, and assumes a firm support for the oxygen and acetylene cylinders, eliminating possibility of overturning them and breaking the regulators or gauges. The frame is of angle iron with a steel plate floor and steel tube handles. The handles, being bolted in place, may be easily removed for shipping or storage. Adjustable chains hold the cylinders in place on the platform. It is a vehicle with 2-in. tread permit easy handling. The truck is 45 in. high and 30 in. wide, and weighs 80 lb. It is finished in black enamel.—*AVIATION, December, 1932*



No. 5 Welding cylinder truck

operation is completed by backing off the die, then removing the threads. These dies cannot be used for cutting new threads. They are available in USS and SAE threads in all sizes from 1/4 in. to 1 1/4 in. inclusive.—*AVIATION, December, 1932*

## Re-threading dies

**B**RUISED and battered threads in bolts or studs may be quickly renewed by their original condition by means of a new series of "old-on" re-threading dies recently announced by the Greenleaf Tap & Die Corporation. These dies resemble an ordinary reamer, the split in two halves and are held together by the tension of a flat spring around one side. Any die may thus be opened up and closed on to the threads to be re-threaded. The stress is then laid over the die, and the latter changed as much by adjusting two screws. The

## Four pillar radio tubes

**D**ESIGNED especially for use under vibration conditions, Eveready Raytheon tubes are now being marketed for use in aircraft radio sets by the National Carbon Company, Inc. The outstanding feature of these tubes is the mounting at the tube elements on four supporting posts, rather than the two usually employed. It is claimed that this method of construction gives greater strength and rigidity, and protects the accurate spacing of the elements against disturbances caused by mechanical shocks and vibrations. These tubes are available in all the common sizes of d.c. and a.c. devices, amplifiers and rectifiers.—*AVIATION, December, 1932*

## Snow sweeper

**T**HEIR approach of winter brings up the snow removal problem at many

airports. A new beam attachment for Chain Sweeper is being manufactured by the Chain Sweeper Company. A 6-ft. split beam beam is mounted under power at 150 rpm is mounted on a yoke hinged to the front end of the tractor. A lever system permits raising the beam out of the way when not in use. Due to the irregularity of the beam with respect to the tractor, all dirt and snow are removed to one side, leaving a clear path for the tractor.—*AVIATION, December, 1932*



## Humidity control

**R**ECENTLY John P. Frost & Son's, Inc., a division of Bendis Aviation Corporation, has announced an addition to the line of instruments for recording and controlling temperature and humidity. The new Frost humidity is a control device provided in standard definite humidity conditions for certain industrial processes, for example, in dye and fabric dyes, by the turning on or off of suitable water sprays through a relay system. Specially prepared human hair is used as the hygroscope element. A hand valve is provided, which can be set along a variable scale to maintain any humidity throughout a range from 20 per cent to full saturation.—*AVIATION, December, 1932*

## Radio beacon trainer

**L**EUT. CARL J. CRANK, co-instructor, May William C. Odier, of "Blind Flight in Theory and Practice" has developed equipment to simulate radio beacons. In many instances it is impractical to locate extensive beacon training due to unsuitability of a standard average beacon. With the Crane trainer installed, however, the instructor or student pilot can set up all types of beacons and blind landing problems.

The device consists of a sending unit which may be mounted in any convenient place in the cockpit floor; a receiving panel for the student's cockpit, consisting of a visual flight indicator, as well as a jack into which the student's headset may be plugged; and a control panel to be mounted in the instructor's cockpit. By manipulating a few simple switches and controls, the instructor can simulate any type of beacon signal at any volume he desires. The equipment is simple to install and operate. It is being manufactured and distributed by Hanger Six, Inc., Waltham, Field, San Antonio, Tex.—*AVIATION, December, 1932*

Flying from  
Floating Fields

Think of a plane that can accelerate from rest to flying speed in a short run on deck. Picture a speed range extending from the fast work of observation to relatively slow deck landing. Consider the structural strength needed for coming in continuously on land and being stopped by arresting gear. Add to these specifications easy handling, finishing performance and intrinsic reliability and you have the Chance Vought Corsair. Chance Vought Corporation, East Hartford, Connecticut. Subsidiary of United Aircraft & Transport Corporation.

CHANCE VUGHT  
CORPORATION

The Frost-Chance snow beam

One of the new 140 m.p.h. Republic planes in operation on the T. W. A. line between Detroit, Toledo, Fort Wayne and Indianapolis, responding to the latter point with the new 24-hour coast-to-coast service.



## T.W.A. ESTABLISHES A SENSATIONAL RECORD IN COMMERCIAL AIR TRANSPORTATION!

Transcontinental and Western Air, Inc., again lowers its coast-to-coast time. Passengers of the T.W.A. air transport service can now take dinner in New York any evening and arrive in Los Angeles for the next.

T. W. A., now, with faster planes and readjustments of schedules, can 11 hours from its New York-Los Angeles time. It is the fastest passenger, air mail and air express transcontinental service in the United States.

## T.W.A. IS 100 PER CENT TEXACO

A 24-hour continuous flight from coast to coast requires the best in fuel and lubricants. T. W. A., having made exhaustive tests on engine test stands and under actual flying conditions, selected Texaco

Aviation Gasoline and Texaco Airplane Oils on their merits for dependability and superior performance. T. W. A. is 100 per cent Texaco.

THE TEXAS COMPANY, 115 East 42nd St., New York City

# TEXACO



"SHORTEST ROUTE  
COAST-TO-COAST"

TEXACO AIRPLANE OILS • TEXACO AVIATION  
GASOLINE • TEXACO AIRBORNE FUEL • TEXACO  
MAKING GREASES • TEXACO ASPHALT PRODUCTS  
(for Runways, Hangar Floors, Aprons & Dual Laying)



LACK of regular battery inspection may be piling up your maintenance costs. And the absence of a voltage regulator may be cutting the life of your batteries.

Have your mechanics keep a close check on the battery as well as the generator and voltage regulator. With equipment properly checked, you will get more reliable performance and longer life from your batteries. Be sure your generators are voltage regulated and carefully adjusted. Fewer beach charges will be necessary. That means money saved.

But, first of all, give your ships a good battery. One that's built especially for aircraft service. The Exide Aircraft Battery is just this type of battery. Lightweight, compact, safe, dependable. Electrolyte will not spill. The performance of Exides over thousands of miles of sky lines every day proves this. Investigate Exides today.

## Exide AIRCRAFT BATTERIES

Construction U. S. Army and Navy

**EXIDE ENGINEERING SERVICE**—Technically trained Exide engineers are located near each of the Exide Air Plants in the United States, and reduce the expense of maintenance work and better safety conditions for your ships by helping with complete Exide service. Exides are cheaper made for this service. Exides are better. Exides are the most reliable. Exides are the most durable. Exides are the most economical. Exides are the most money.

**THE ELECTRIC STORAGE BATTERY CO., Philadelphia**  
The World's Largest Manufacturers of Storage Batteries for Every Purpose  
Exide Batteries of Canada, Montreal, Toronto

**They all use B.G.**  
Mica Aviation Spark Plugs  
**THE B. G. CORPORATION**  
Incorporated in the State of New York, and 1000 Broadway, New York City  
430 W. 124th St., New York 19, N. Y. (In other addresses elsewhere, New York)



## • TRANSPORT •

NO TRANSPORTATION EXECUTIVE, concerned with the continuous, economical operation of schedules, would buy a motor bus that was not the standardized product of straight-line, machine production methods. He would realize that otherwise all negotiating, servicing, maintenance, and part replacements on his equipment would take too long and cost too much. ★ Yet in the field of air transportation, where savings in time and money are equally important, many airplanes still are produced a few at a time by hand methods. Obviously, although improvements in design will continue to contribute to the progress of flying, the improvements most needed must come from improved methods of manufacture. ★ Fortunately, the Martin Company focuses this fact years ago, and put that knowledge to practical application in the development of its organization and in the layout and equipment of its plant. ★ As a result, it is our sincere conviction that nowhere else in the industry is modern manufacturing efficiency so highly developed; that nowhere else in the industry can aircraft of equal quality be produced at lower cost.

*Glenn L. Martin*

**The Glenn L. Martin Company**

Baltimore, Maryland, U. S. A.

BUILDERS OF DEFENDABLE AIRCRAFT SINCE 1909

# Eliminating Risk from Air Travel



Wright "Whirlwind" 20

Wright "Whirlwind" Engines  
use SRB BALL BEARINGS



Wright "Whirlwind" 210



Wright "Whirlwind" 165

**S**RB Ball Bearings have been used on Wright Engines for the last ten years. To any engineer this should be convincing evidence of their dependability. Bear in mind, too, that Wright is not alone in its high regard for SRB Ball Bearings . . . practically all American Aircraft Engine Builders use them.

When Ball Bearings are required for exacting performance, specify SRB—they have the endorsement of an industry that demands DEPENDABILITY.



## Marlin-Rockwell Corp.

MANUFACTURERS OF

### GURNEY SRB STROM M-R-C BALL BEARINGS

EXECUTIVE OFFICES: JAMESTOWN, N. Y.  
FACTORIES AND BRANCHES AT JAMESTOWN, N. Y., PLAINVILLE, CONN., CHICAGO, ILL.

# Built for DEPENDABILITY

Bellanca Aircraft of today represent the mature skill and experience of a great designer. These airplanes are far and away the acknowledged leaders for efficiency and dependability. Not only in notable, world-famous expeditions, but also in the grueling work of everyday service, Bellanca planes have proved themselves utterly reliable.



#### THE BELLANCA FACEMAKER

See plan *Cuba Monoplane*  
(unavailable load and engine)  
with Wright J8 Series "C"  
Super-developing 300 h.p.

High Speed	130 m.p.h.
Cruising Speed	125 m.p.h.
Range	174 miles
Climb (at sea level)	750 ft./min.
Service Ceiling	14,000 ft.
Span	41 ft. 6 in.
Wing Area	351 sq. ft.
Useful load	
Gustload	1,380 lbs.
Oil	120 lbs.
Fuel and payload	1,250 lbs.

Also performance with Wright "Cyclone" Series "7" Engine, developing 420 h.p., plane also available with power or diesel drive P & W "Wasp" Engine or liquid-cooled Curtiss-Wright "Conquest" Engine

#### THE BELLANCA AERBUS

See plan *Cuba Biplane*

High Speed	154 m.p.h.
Cruising Speed	131 m.p.h.
Range	174 miles
Climb (at sea level)	750 ft./min.
Service Ceiling	14,000 ft.
Span	41 ft. 6 in.
Wing Area	351 sq. ft.
Useful load	
Gustload	1,380 lbs.
Oil	120 lbs.
Fuel and payload	1,250 lbs.

Also performance with Wright "Cyclone" Series "7" Engine, developing 420 h.p., plane also available with power or diesel drive P & W "Wasp" Engine or liquid-cooled Curtiss-Wright "Conquest" Engine

#### THE BELLANCA SEVROCKEY

See plan *Cuba Monoplane*

High Speed	130 m.p.h. (at 6,000 ft.)
Cruising Speed	125 m.p.h. (at 6,000 ft.)
Range	174 miles
Climb (at sea level)	750 ft./min.
Service Ceiling	14,000 ft.
Span	41 ft. 6 in.
Wing Area	351 sq. ft.
Useful load	
Gustload	1,380 lbs.
Oil	120 lbs.
Fuel and payload	1,250 lbs.

Deluxe Type (above) includes Landing Lights, Bag Cart, Seats or Wicker, and Wood, Fume, Floor, Artificial Horizon, Cabin arrangement and painting to customer's option

Full particulars and prices on request

SPECIAL PLANES BUILT TO ORDER FOR SPECIFIC PURPOSES

# BELLANCA

BELLANCA AIRCRAFT CORPORATION

New Castle, Delaware

Bellanca Aircraft of Canada, Ltd., Montreal



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Solve the gift problem this way, effective way. Give handsome, useful McGraw-Hill books, with the distinctive personal touch of the recipient's name stamped in gold on the front cover. And take advantage of this limited opportunity to have your name stamped on books for your own library. Send the coupon below. (Reader's name should be enclosed with orders, and, of course, stamped copies are not returnable.)

### 1. **Wheeler and Johnston's—** **AVIATION HANDBOOK** ..... \$7.50

This book brings together under one cover a great volume of valuable reference data for the aeronautical engineer, designer and draftsman. From many authoritative sources, some of them not otherwise generally available, have been gathered up-to-date and constantly revised information on the theory of heavier-than-air craft, materials and their properties, drawings and weight estimation on standard parts, performance data on engines and other large units, including model aircraft data, etc.

### 2. **Chapfield and Taylor** **THE AIRPLANE AND ITS ENGINE—New Second Edition** ..... \$3.00

Intended primarily for the reader who desires a sound knowledge of the basic principles and a broad scope of the present development of the airplane and its power plant. No practical or the subject which is more than an elementary basis of design or construction for its understanding. The discussion of the fundamental principles concerning the construction of the airplane and its engine are presented in simple form and adequately illustrated.

### 3. **Younger—** **AIRPLANE CONSTRUCTION and REPAIR** ..... \$3.00

This book gives in convenient form fundamental material for complete training in the design of an airplane machine. It presents problems and experience for practical application and the study of the basic concepts. The experience is simple to describe and may be performed with the ordinary equipment of the average shop.

### 4. **Wheeler—** **AIR NAVIGATION** ..... \$3.00

In this compact a special effort has been made to include the material necessary to enable one to fly an airplane machine in complete confidence. The book covers piloting (or map reading), dead reckoning, navigation, radio position finding and meteorological principles. The discussion of meteorological principles includes a description of new efficient and novel methods and equipment now heretofore available in air navigation.

### 5. **Reid—** **APPLIED WING THEORY** ..... \$3.00

The book is written in English to present a comprehensive treatment of the theory of aerodynamic subjects, using applied theory and its applications in a form which can be readily followed by engineers and draftsmen. The fundamental material is quite supported by experimental evidence and supplemented by helpful mathematical and physical analogies.

### 6. **Wheeler—** **AERODYNAMICS** ..... \$2.50

This book presents a brief but complete non-mathematical discussion of the aerodynamics. Its purpose is to tell the reader how the aerodynamic works, how to interpret the standard phenomena the engineer would find, and how best to use the results of the reports, tables and formulas now made available.

### 7. **Mott—** **AVIATION** ..... \$2.50

This book is planned as a textbook for aviation training for the Transport Pilot's Examination, and is a text and reference book in one volume for the aviation engineer. It covers all piloting, dead reckoning, radio navigation and aerodynamic principles fully and gives a complete outline of engine principles. The book was written with Department of Commerce requirements and United States Army and Navy practice test in mind.

### 8. **Miller—** **THE AIRCRAFT MECHANIC'S HAND-BOOK** ..... \$2.00

This book covers all the data, information and methods that the mechanic needs in order to handle the work of airplane maintenance and repair in accordance with the highest standards. The book is written in easy, plain language and covers from and with what tools are necessary and how to use them—describes the materials of airplane construction and how to handle them—gives methods for the repair of all parts of the aircraft and explains—describes important methods thoroughly, etc.

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Send me the books listed below with your name stamped in gold free on the front cover. (This is a special Christmas offer. Request to accompany before January 1, 1933.)

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## Vast Resources—High Craftsmanship—Far-sighted Vision—BENDIX

Nobody deliberately and knowingly buys inferior equipment for aircraft, where quality and fine performance are so necessary—yet there's no argument that certain products are better than others.

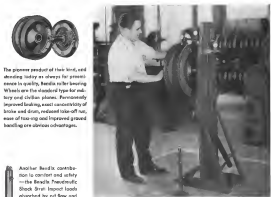
In the face of unrelenting pressure to reduce quality, Bendix believes that Aviation is best served by building every product as nearly perfect as possible, aiming at superlative performance.

Bendix Wheels and Brakes for airplanes and the new Bendix Pneumatic Shock Strut are examples

of how vast resources, high spirit of craftsmanship, and far-sighted vision may all be inspired by a single idea—a determination to produce "the best."

And typically Bendix is the development of special and exclusive machinery used in their manufacture contributing to superior quality and lower costs.

The services of Bendix' corps of competent engineers are always available for consultation.



The pioneer product of their kind, and standing today as always for preeminence in quality, Bendix roller-bearing wheels are the standard type for military and civilian planes. Permanently improved landing, exact concentricity of brake drum, reduced take-off run, ease of taxiing and improved ground handling are obvious advantages.

Another Bendix contribution to comfort and safety—the Bendix Pneumatic Shock Strut Impact Loads absorbed by oil flow and air compression above the oil landing loads by air compression. Exceeds definitely controlled by absorber.

**Wheel Inspection**—Bendix wheels are checked 100% for round. This machine checks three points simultaneously. The indicators, from left to right, show concentricity of wheel, its total outside of wheel and brake drum round. The indicator is thus assured of wheels which will roll true and of brake drums so nearly concentric that maximum brake efficiency is obtainable throughout a long period of severe service.

**BENDIX BRAKE COMPANY · South Bend, Indiana**

(SUBSIDIARY OF BENDIX AVIATION CORPORATION)





## Sixteen Feet in Diameter

• Largest of recent production propellers are those being designed and built by the Hamilton Standard Propeller Company for the USS "AKRON" and the USS "MAGN."

• This recognition of the highly specialized experience, which is vouchsafed by the Hamilton Standard seal, is of interest to all designers, builders, and operators of aircraft.



• Every variation in airship specifications presents a separate group of design and production problems. In the solution of these problems this organization invariably makes full use of its ample research facilities and its highly specialized engineering staff. Only Hamilton Standard experience and technical skill can produce Hamilton Standard reliability.

HAMILTON STANDARD PROPELLER COMPANY  
EAST HARTFORD CONNECTICUT  
Subsidiary of United Aircraft & Transport Corporation



*Marie Paret Flying Boat, F1302 equipped with Fafnir Aircraft Bearings*

# "In out-of-the-way places, too!"

Here's what the Glenn L. Martin Company has to say of their ships:

"In these airplanes, as in the average airplane installation, control cables must pass over numerous pulleys. Each cable must always be free and capable of movement, with a mass mass of resistance. Fafnir Ball Bearings have been selected as standard, and are used in all pulleys, and in wheel, roller, and elevator hinge points.

Because Fafnir Bearings are double-sealed, and grease filled, they lend themselves in use in out of the way places in aircraft structures. Corrosion-preventing prevents corrosion,

which enhances their value to the aircraft designer, as does their light weight."

The saving of weight and space, the great reduction of control system friction, the virtual maintenance and elimination of replacement—these and many other practical benefits have been largely due to the development of Fafnir Aircraft Bearings, whose wide range includes seal and cartridge designs, both of which are used in Martin ships. For valuable information concerning load ratings, dimensions and recommended uses ask for the Fafnir Aircraft Catalog.

THE FAFNIR BEARING COMPANY, New Britain, Conn.

Atlanta Chicago Cleveland New York Dallas Detroit Philadelphia San Antonio St. Louis



*Fafnir selected as standard on Marine Corps Service, E162*

## Fafnir·Ball·Bearings

"The dead take  
to their graves, in their  
clutched fingers, only that  
which they have given away"



**THIS** is your chance to do more good with the money you give to others than was perhaps ever before possible in the history of this country.

First, because the need is greater than ever before. Second, because more of every dollar you give will go to provide your fellow human beings with food, shelter, medical help—the bare necessities of living.

The Welfare and Relief Mobilization for 1932 is a cooperative national program to reinforce local fund-raising for human welfare and relief needs. No national fund is being raised. Each community is making provision for its own people. Each community will have full control of the money it obtains.

Read again the great words attributed to Rousseau which are printed at the top of this page. They pass through your established welfare and relief organization, through your community chest, or through your local emergency relief committee.

*Welfare and Relief Mobilization for 1932*  
BENTON D. BAUER CHAIRMAN  
NATIONAL CITIZENS' COMMITTEE

WELFARE AND RELIEF MOBILIZATION, 1932

## LIMITLESS

To assure—even the most seasoned—there is no limit to the cloud-world's vastness, to its ever-changing grandeur, to its fascination.

Under the spell of such beauty it is easy, perhaps, to take for granted—to forget—the smooth working, dependable units which make flight easy.

To be as easily "limitless" as possible—in smoothness, in automatic adaptability to every need and every position, in length of service—this is the basic purpose built into every Stromberg Carburetor.

That operates and pilots recognize as Stromberg this faithfulness to an ideal, is well shown by the fact that 95% of all aircraft flying in the United States today are equipped with Stromberg Carburetors.

Stromberg V-8 carburetor, double barrel, pressure carburetor, and flow carburetor. Bore diameter 2 1/2". The carburetor used in this ad, right.

## STROMBERG CARBURETORS

**BENDIS STROMBERG CARBURETOR COMPANY**  
INCORPORATED IN MISSOURI—CHICAGO, ILL.

211 NORTH STATE, CHICAGO, ILL.









# KOHLER AVIATION CORPORATION

## MILWAUKEE-DETROIT SERVICE

*operate the year-round with*

## WRIGHT "CYCLONES"



**W**RIGHT "Cyclones" are used exclusively to power the fast Milwaukee-Detroit service of Kohler Aviation Corporation—an important air-rail link between the Northwest and the thickly populated Atlantic Seaboard.

Kohler Aviation Corporation has established an enviable record during the past three years . . . 7,900 hours flown . . . 750,000 air miles traveled . . . approximately 10,000 passengers carried and 221,000 pounds of express.

Since its inception, Kohler Aviation has used Wright Engines exclusively, operating across Lake Michigan, a distance of 85 miles over open water, 12 months a year—a notable achievement.

Wright Engines power millions of miles of air transport travel every year. Their dependability under the hard, grueling conditions of transport service has made Wright-powered planes the choice of air mail, express and passenger operators around the world.

*Contractors to the Governments of the World*

**WRIGHT**  
AERONAUTICAL CORPORATION  
PATENSON NEW JERSEY

A DIVISION OF CURTIS WRIGHT CORPORATION



## 309 m.p.h. for a World's Record

*... and more proof of*

## Roebling Control Cord Stamina

**A**T the National Air Races, this Gee Bee Super Sportster with Major Doolittle at the controls averaged 294.39 m.p.h.—a new world's record for land planes. On one of the four laps over the course a speed of 309 m.p.h. was attained. Cleveland also saw this famous racing combination win the coveted Thompson Trophy.

Roebling takes pride in the fact that standard Roebling Control Cord was selected to help guide the Gee Bee Airplanes entered in the race. Its satisfactory performance under the great strains of racing furnishes more proof of the stamina of this line cord—ad-

ditional assurance of highest dependability in the less spectacular service of air transport and private planes.

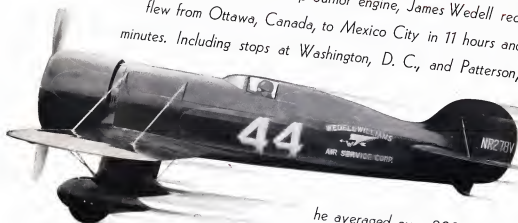
Roebling predetermines the reliability of Control Cord and other Roebling Wire Aircraft Products by the most rigid testing. You can use them with full confidence. We invite your request for samples and full information.

### Roebling Wire Aircraft Products

Tension Aircraft Wire; 15 Wire Aircraft Brand; Tension Control Cord; Aircraft Control Cord; 1/4", 3/8", 1/2", 5/8", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3", 3 1/2", 4", 4 1/2", 5", 5 1/2", 6", 6 1/2", 7", 7 1/2", 8", 8 1/2", 9", 9 1/2", 10", 10 1/2", 11", 11 1/2", 12", 12 1/2", 13", 13 1/2", 14", 14 1/2", 15", 15 1/2", 16", 16 1/2", 17", 17 1/2", 18", 18 1/2", 19", 19 1/2", 20", 20 1/2", 21", 21 1/2", 22", 22 1/2", 23", 23 1/2", 24", 24 1/2", 25", 25 1/2", 26", 26 1/2", 27", 27 1/2", 28", 28 1/2", 29", 29 1/2", 30", 30 1/2", 31", 31 1/2", 32", 32 1/2", 33", 33 1/2", 34", 34 1/2", 35", 35 1/2", 36", 36 1/2", 37", 37 1/2", 38", 38 1/2", 39", 39 1/2", 40", 40 1/2", 41", 41 1/2", 42", 42 1/2", 43", 43 1/2", 44", 44 1/2", 45", 45 1/2", 46", 46 1/2", 47", 47 1/2", 48", 48 1/2", 49", 49 1/2", 50", 50 1/2", 51", 51 1/2", 52", 52 1/2", 53", 53 1/2", 54", 54 1/2", 55", 55 1/2", 56", 56 1/2", 57", 57 1/2", 58", 58 1/2", 59", 59 1/2", 60", 60 1/2", 61", 61 1/2", 62", 62 1/2", 63", 63 1/2", 64", 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# Cutting 43 Minutes from North America's 3-Capital Flight Record

Flying a Wedell-Williams Special, of his own design, powered with a Wasp Junior engine, James Wedell recently flew from Ottawa, Canada, to Mexico City in 11 hours and 53 minutes. Including stops at Washington, D. C., and Patterson, La.,



he averaged over 200 m.p.h. for the 2485 mile trip. In spite of bad weather and head winds for a large part of this distance, Mr. Wedell lowered the previous record for the flight by 43 minutes. Leaving Ottawa just before 6 A. M. and landing at Mexico City a few minutes before 6 P. M., he demonstrated the feasibility of communication by air with the three largest North American capitals between dawn and dusk. Equally impressive was his demonstration of the inherent stamina of his Pratt & Whitney engine — and its complete dependability under sustained high speed operation.



## Wasp & Hornet Engines

\*REGISTERED TRADE-MARK  
THE  
**PRATT & WHITNEY AIRCRAFT CO. . . EAST HARTFORD . . . CONNECTICUT**  
Subsidiary of United Aircraft & Transport Corporation  
Manufactured in Canada by Canadian Pratt & Whitney Aircraft Co., Ltd., Longueville, P. Q.;  
in Germany by Bavarian Motor Works, Munich; in Japan by Nakajima Aircraft Works, Tokyo.